



## The Changing Climate of Livelihoods: Case Studies from Bangladesh, India and Indonesia

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November 2015



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*Cover Photo: 'Field trip to Bagerhat in Bangladesh'  
The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*

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# FOREWORD

As climate experts, environmental activists, and energy policymakers look toward the most anticipated climate change summit in recent memory — the United Nations Climate Change Conference, or COP21, to be convened in Paris this December — the global debate on the climate revolves around familiar topics: greenhouse gas reduction targets, the global temperature rise, and the schism between developed and developing countries on climate action.

Meanwhile, the true impact of climate change on people and their livelihoods rarely takes center stage. For most participants at the Paris conference, climate change is still an abstraction — felt, perhaps, in unusually hot summers. But for millions of people around the world, climate change is already disrupting something far more fundamental: their ability to earn a living and provide for their families. This impact of climate change must be addressed in the context of the new Sustainable Development Goals Agenda 2030, adopted in September, which recognizes

that eradicating poverty is the greatest global challenge and an indispensable requirement for sustainable development.

Climate change is a formidable threat to the working lives of people across the globe — especially those whose employment depends on agriculture. From erratic rainfall to flash floods, from salinity intrusion to altered ocean currents, the impacts of climate change are forcing people to search for new livelihoods. For many, that search takes them far from home.

The trade union movement must step up its work and attention on climate change, as it poses one of the gravest threats to ensuring workers around the world have just jobs. Not only do the impacts of climate change take away people's livelihoods; they also speed up the processes that are making work more precarious. Climate-induced migration accelerates migration to cities, saturating urban labor markets and placing downward pressure on wages and working conditions. Climate migrants,

like other migrant workers, are more likely to wind up in temporary contracts with few legal rights.

In a globalized world, a threat to the well-being of workers anywhere becomes a threat to workers' well-being everywhere. The current refugee crisis in Europe is evidence of this.

The global movement to address climate change needs the strength of workers and unions to succeed. As Sharan Burrow, General Secretary of the International Trade Union Confederation, recently remarked: "Industrial transformation is critical to achieve a zero-carbon future. We know

it can't happen without dialogue with workers in the workplace and in national plans for our economies and industries."

In the context of accelerating climate change, trade unions have an opportunity and a responsibility to broaden their mandate. They must make climate change advocacy one of their central goals, pressing governments and the private sector to focus on the workers whom climate change displaces and facilitating research and dialogue on the nexus of climate change and employment.



**Sabina Dewan**

Executive Director  
JustJobs Network



**Dr. Vikrom Mathur**

Senior Research Fellow  
Observer Research Foundation



**Kristina Henschen**

Director  
Union to Union

## Introduction

International leaders will gather in Paris next month to chart a path toward curbing the environmental crisis that is gripping the globe. Emissions targets, cap-and-trade and execution of the Green Climate Fund will dominate the agenda at this Conference of Parties, or COP21. But how to minimize the detrimental impact of climate change on jobs and incomes – the issue that matters most to millions of people across the globe – will likely receive little attention.

It is imperative that this issue be elevated in the global debate – especially since economic development and climate change action are often

pitted against one another in policy discourse. Some predictions suggest that there could be as many as 200 million climate migrants by 2050.<sup>i1</sup> If the current Syrian refugee crisis is any indication, the world is ill-equipped to deal with this much greater challenge.

Climate change is dramatically reshaping migration, changing economic activity and altering rural and urban labor markets. Understanding these changes is paramount to managing the negative impact of climate change on the jobs and incomes of regular people.

<sup>i</sup> Estimates of climate migration (by 2050) range from 25 million to 1 billion migrants. The 200 million figure is accepted widely and has been cited by publications such as the IPCC report.

# Climate change, migration and just jobs

## Box 1. Spotlight: Cox's Bazar District, Bangladesh

For decades, Abdul Gaffar eked out a living by working the three acres of land he owned on Kutubdia Island in the Cox's Bazar District of Bangladesh. But today, he works for others, catching fish in the same Bay of Bengal waters that swallowed the plot he used to own. Kutubdia once contained 54 square kilometers. Today only 27 square kilometers remain. The rising sea level has claimed the other half. Unlike Abdul, many more have been forced to leave the island. Over 100,000 of Kutubdia's residents are now displaced throughout Cox's Bazar District.<sup>2</sup> The sea has consumed people's land, drowned their homes and forever changed their livelihoods.

From Assam to Java, from Nepal to New Zealand, climate change is transforming the way people live and work. In some cases, climate change manifests in swift and drastic occurrences such as cyclones, storm surges or droughts. In other cases, slower, prolonged changes – visible in gradually rising sea levels, salinity intrusion and diminishing precipitation, for example – are playing out in the environments where millions of people reside. There is no doubt that, whatever its extent, climate change will dramatically alter where people live, the work they do, and how they do it.

Climate change and employment interact in five ways. First, whether through a natural disaster or gradually over time, climate change has a direct bearing on jobs and incomes in affected geographies, and especially in regions that depend on agriculture. For instance, in Tanzania, changes in the mean temperature and rainfall patterns will extend dry seasons and make periodic droughts more severe,<sup>3</sup> directly altering the livelihood of thousands of farmers and their families.

Second, these types of changes also set off a chain reaction that disturbs a whole host of ancillary services and sectors – the indirect impact of climate change on jobs and incomes. Staying with the example of Tanzania, as crop yields fall because of changes in precipitation, this affects those responsible for transporting the products to market, and the associated processing and export industries. Retailers, meanwhile, may see their inventories diminish or consumer demand dwindle as market prices rise or fluctuate unpredictably in response to disruptions in the supply chain.

Third, as a coping strategy, those in the rural economy look to diversify their livelihoods away from their primary occupation. Declining crop yields may push farmers to explore new avenues of income such as livestock rearing or local non-farm wage labor. Rural workers seeking non-farm wage employment may increasingly be required to migrate – since the adverse impacts of climate change will likely affect entire localities, both agriculture and other parts of the economy.



Fourth, climate-induced migration, whether temporary or permanent, affects the labor markets of host geographies. Migration pressures fuel rapid urbanization. When cities grow due to “push” factors rather than “pull” factors – in other words, when people migrate because of a dearth of opportunities at home rather than an expansion of opportunities in cities – urban labor markets grow saturated, which puts downward pressure on wages and working conditions. Moreover, cities frequently lack the infrastructure, governance and services – clean water, sewage systems, housing – to accommodate migrants. This can lead to urban slums where residents face poor health and economic outcomes.

Finally, on the flip side of the adverse effects of climate change on livelihoods is the potential for job generation that arises from climate adaptation and mitigation. Disasters, for instance, generate jobs in relief, clean up and construction. Swedish farmers are leading in the field of conservation agriculture that sequesters carbon into the soil, reducing carbon emissions. This is also a prevalent practice in Latin America and has the potential to

***Climate change is dramatically reshaping migration, changing economic activity and altering rural and urban labor markets. Understanding these changes is paramount to managing the negative impact of climate change on the jobs and incomes of regular people.***

generate jobs in other regions. Expanding the production of renewable energy as a strategy to combat climate change has the potential to spur new employment in grid construction and upgrading to smart grids, production of small-scale renewables, distribution, installation and maintenance.<sup>4</sup> The International Labour Organisation (ILO) and the International Trade Union Confederation stipulate that policies facilitating climate transition could generate up to 60 million net jobs.<sup>5</sup> It is important to note that while the expansion of the renewable energy sector and other mitigation efforts will create jobs, they will be far less significant in scale and scope as compared to the livelihoods that will be lost due to the impact of climate change.

Both managing the negative effects of climate change on employment and incomes on one hand, and leveraging the positive job generation potential of mitigation and adaptation on the other, require action on behalf of multiple stakeholders — including governments, the private sector and trade unions.

## Key recommendations

- Existing research, much of which is based on anecdotal evidence, is woefully inadequate and inconsistent in estimating the direct and indirect impact of climate change on employment. The same is true of climate-induced migration and its impact on labor markets, especially in host geographies. More research is needed to ensure that (i) policymaking to reduce the negative impact of climate change on jobs and incomes is backed by reliable data; (ii) businesses understand the potential disruptions to their value chains and hedge against them in ways that minimize the impact on jobs; and (iii) workers are protected in the event of temporary or permanent disruptions to their livelihoods brought on by climate change.
- To this end, a common set of indicators should be developed to allow the vulnerability of areas and communities to be compared over time and with each other. The lack of such indicators was an obstacle in preparing this report. These indicators will not only allow policymakers to measure progress, but they will assist in decision-making on where to allocate resources.
- Policymakers must also ensure that the needs of marginalized populations and circular migrants are taken into account when assessing vulnerability. Censuses should include questions pertaining to migration, including climate-induced migration.<sup>6</sup> All three key stakeholders – governments, businesses and trade unions – must facilitate research to these ends.
- While existing livelihoods should be preserved wherever possible, some income-generating activities are undesirable in terms of the environmental damage they cause. Other livelihoods will become unsustainable due to the effects of climate change. Governments should identify vulnerable occupations as well as sustainable alternatives. With the aid of grassroots organizations, people can be provided information about these alternatives in order to help them transition into new livelihoods or diversify their income streams. Governments should also support the growth of entrepreneurship and MSMEs as a means of diversification by providing easy access to credit and training. This strategy will require involvement from – and creates opportunities for – the private sector.
- Private sector companies should plan for the potential supply chain disruptions that climate change may cause and invest proactively in innovations that can increase resilience of affected sectors – for example, new seed varieties that have higher tolerance

for salinity. This in turn will help protect the livelihoods of workers dependent on those affected industries.

- Governments must examine the employment potential of mitigation and adaptation strategies and pursue those that have the greatest capacity to create jobs. For example, they should support the development of the renewable energy sector, especially its labor-intensive manufacturing activities, to help offset some of the job and income losses that occur as a result of climate change.
- Whether government-based or employer-based, social safety nets are essential not only to protect workers whose livelihoods are impacted by climate change but also to smooth consumption and maintain aggregate demand during times of climate-related adversity. Trade unions must push for the establishment and strengthening of these safety nets.
- Over the long-term, all three stakeholders must invest in skills training and apprenticeships that can help transition people out of affected activities and sectors into those that are resilient to climate change.

- Finally, the new world of work, under stress from climate change, requires innovative approaches to incorporating climate migrants into host communities. Apart from discrimination in receiving communities, migrant workers face a number of other problems in joining the workforce. International migrants often lack documentation which is required to obtain employment in the formal sector. Migrant workers may also face language barriers, even if they are migrating internally from one region to another. Skilled migrant workers may end up taking unskilled jobs if their educational or vocational certifications are not recognized.

Governments can reduce barriers for migrants by providing language training and vocational training, which would also aid in the process of social assimilation. Skilled workers should be given the opportunity to take equivalency tests or bridge courses so that they are not underemployed. Trade unions should proactively reach out to and help climate migrants joining the labor market to organize themselves and join workers' organizations.

## Climate migration

For some climate migrants, relocating is the strategy for coping with increasingly insecure livelihoods. For others, it is an absolute necessity. Climate migrants generally follow the same pathways as other migrants, but climate-induced migration is adding to the pace and scale of human mobility. In the next several decades, climate change's impact will likely intensify and put more stress on existing migration patterns rather than create new migration destinations, flows and behaviors.<sup>7</sup> Current trends are therefore a guide for how people will move in the future, albeit varying based on how climate change unfolds in specific geographies. Acute disasters such as landslides and cyclones affect migration differently than chronic, persistent hazards such as droughts or salinity intrusion. The former will fuel rapid out-migration that is likely to be temporary in nature, while the latter will induce a slower out-flow, with relocation that may become permanent over time.

Distress migration patterns emerge with the onset of sudden disasters or ongoing chronic hazards. Distress migration looks different depending on the severity and geography of the disaster, capabilities of households to respond, evacuation possibilities, vulnerabilities, relief and intervening government policies. Most communities encounter three options in disaster relief: i) to depend on social networks; ii) to depend on agencies that have access to aid and explore resettlement; iii) to go to relocation

camps for temporary or long-term resettlement help. Ultimately, return rates for disaster victims are high. In the short-term, climate change will lead to temporary rather than permanent displacement. Those with means may have the option to migrate internationally, but others will migrate internally to nearby geographies.<sup>8</sup>

Temporary displacement poses its own challenges in terms of employment. When livelihoods are disrupted in places of origin, the uncertainty about how long the dislocation will last makes it hard to assimilate workers into the labor market in host locations. Such temporary migrants then have little recourse but to work in provisional and frequently precarious forms of employment. Internal migrants are likely to be poor and unskilled, making them highly susceptible to labor exploitation.

Individual, community and national vulnerabilities affect the ability to adapt to changes as a result of climate change. The ability to effectively incorporate risk depends on available assets. People adapt to the adverse impact of climate change principally by diversifying income streams, and circular labor migration between rural and urban areas is one way of doing so. To understand how local labor market conditions, unique vulnerabilities, and the particularities of climate change intersect in specific countries, the following sections take up Bangladesh, India and Indonesia as case studies.

## UP TO ONE BILLION PEOPLE WILL BECOME ENVIRONMENTAL MIGRANTS BY 2050



18 million of these will be from Bangladesh alone, displaced by rising sea levels.

Climate change accelerates migration to cities, leading to saturated urban labor markets and downward pressure on working conditions.



### Tea growers lose jobs

Climate change puts at risk the livelihoods of the one million people in north east India who depend on the tea industry.



### Destruction of homes and farm lands

Severe floods will submerge two-thirds of Bangladesh.



### Farm laborers lose jobs

Rising sea levels will force over 80,000 Indonesian farmers out of their farms and into cities.

Impact of climate change on livelihoods and incomes is lost amid discussions of subsidies and targets for emission reductions.

Policymakers must examine the employment potential of climate mitigation and adaptation strategies.



Sources: <http://www.ion.int/complex-nexus#estimates>

[http://www.myltimes.com/2014/03/29/world/asia/facing-rising-seas-bangladesh-confronts-the-consequences-of-climate-change.html?\\_r=1](http://www.myltimes.com/2014/03/29/world/asia/facing-rising-seas-bangladesh-confronts-the-consequences-of-climate-change.html?_r=1)

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# Understanding human mobility: Four kinds of migration

## *Distress migration*

Distress migration is the movement of people, often temporary, before, during or after a natural disaster. People choose destinations based on community networks; ethnicity; regional stability; social capital; personal assets; presence of aid agencies; the availability of needed provisions; and the distance from the affected person's home to the relief area.<sup>9</sup> Local displacement – moving to the nearest safe location – is the most common response to a disaster. In the long run, people generally do not move away permanently from affected areas in situations where disaster aid is well-organized and distributed equally.<sup>10</sup> As a consequence of involuntary migration, the displaced face socio-economic impoverishment and marginalization. This is exacerbated in situations where people do not have dependable social networks and aid is inequitable or poorly managed. In extreme cases, distress migration can result in abject misery, destitution, beggary and fatalities.<sup>11</sup>

## *Circular migration*

Circular migration is the temporary and often repetitive movement of people from their homes to host areas. Typically, people migrate in this manner for employment. The United Nations

Development Programme estimates that there are roughly 100 million circular migrants in India alone.<sup>12</sup> Unemployment will rise in rural areas due to higher variability in crop yields as a consequence of climate change. Correspondingly, circular migration, as it is a way to cope with economic or climate shocks, is expected to increase significantly. Circular migrants tend to be concentrated in sectors such as construction, textiles, brick-making, stone quarries, mines, seafood processing and hospitality services.<sup>13</sup>

Studies have shown that poor migrant labor is the preferred labor by industrialists, agriculturalists, and service providers for work that does not require skills. To them, migrant workers are flexible, cheap, and can be hired and fired at will since they tend to fall beyond the purview of labor protections.<sup>14</sup> And even when labor laws exist and apply to migrant workers, enforcement is often lacking. In addition, minimum wage and equal pay laws are not fully implemented.<sup>15</sup>

## *Permanent out-migration*

Permanent out-migration shares many of the same characteristics as circular migration such as being driven by employment motives. The major difference is that migrants relocate permanently.



**Distress Migration**



**Circular Migration**



**Permanent Out-Migration**



**International Migration**

The incidence of permanent out-migration is much lower than circular or temporary distress migration. Climate change will induce permanent out-migration only in the cases of chronic threats such as drought and salinity intrusion. If floods become incessant, as they often do in Bangladesh, they can also cause permanent out-migration.<sup>16</sup>

#### ***International migration***

International migration is when an adult member of a household migrates to another country, often with the goal of sending home remittances. The migrant keeps ties with his or her country of origin. As climate change affects rural areas, workers often migrate to the cities. As the labor markets in cities become saturated with labor, this exerts downward pressure on wages and working conditions. Under such circumstances, many may find working overseas alluring.

International migration routes from India and Bangladesh to the Middle East are well established. The majority of migrants who follow these routes are unskilled men who mostly

work in construction.<sup>17</sup> However, two-thirds of international migrants from Indonesia are women. Usually they work as domestic workers in other Southeast Asian countries.<sup>18</sup> Tragically, international immigrants arrive in countries where they have few or no rights and protections. Many are cheated out of wages, and subject to dangerous working conditions as well as densely packed and unsanitary living conditions. There are many instances where passports are confiscated and wages withheld. In these cases, migrant workers have little recourse to escape or protest.<sup>19</sup>

A terrifying example of these abuses is the building of stadiums in anticipation of the 2022 FIFA World Cup in Qatar. Roughly 1.4 million migrant laborers, who are mostly from India, Bangladesh, Sri Lanka and Nepal, work long hours in temperatures that are regularly above 50 degrees Celsius. The heat along with workplace accidents result in about one death per day.<sup>20</sup>

**Note:** People who leave their countries of origin due to the effects of climate change are not legally considered refugees. While the term “climate change refugee” is sometimes used rhetorically, the definition of a refugee - as written in the 1951 United Nations Convention Relating to the Status of Refugees - is an individual who “owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality.



# Climate change and livelihoods in three geographies

This report examines how climate change, through sudden as well as protracted developments, affects livelihoods and migration patterns. It examines Bangladesh, India and Indonesia as country case studies.

The life-altering effects of climate change are especially pronounced for the people in these three developing countries. The phenomenon's most drastic disruptions will occur in tropical zones – home to some of the highest populations and population densities in the world. Together, Bangladesh, India and Indonesia make up almost a quarter of the Earth's inhabitants. Because climate-related disasters there affect such a large share of the global population, their consequences will reverberate everywhere in the world. Further, understanding the effects of

climate change on people, labor markets and economies in Bangladesh, India and Indonesia will provide insights relevant to other countries in the Global South.

In the following case studies, specific sectors are taken as examples to illustrate how adaptation and mitigation measures – as outlined in the Intended Nationally Determined Contributions plans (INDCs) for these countries – will affect labor market dynamics. These climate plans have been submitted with the express purpose of conveying the actions each country is willing to take with regard to mitigation and adaptation, post-2020. Beyond this, they highlight national priorities and unique national circumstances that will guide climate policy in the coming decades.



# Bangladesh

Bangladesh is among the nations most vulnerable to inclement weather. The densely populated nation of over 150 million people has a long history of floods, cyclones, salinity intrusions, and droughts. Such frequent disasters disrupt livelihoods and destroy assets and savings. Some argue that this may be the primary explanation for the country's ongoing poverty.<sup>21</sup>

In the future, these weather catastrophes are expected to intensify and become more common. The impact of climate change will not just be isolated to particular regions within the country, but will be felt profoundly throughout Bangladesh, potentially derailing the benefits accrued through economic growth of over six percent per year in the last decade.<sup>22</sup> Adapting to and mitigating the effects of climate change calls for deep involvement on behalf of all stakeholders in Bangladesh—including the private sector and grassroots organizations, both of which can help communities adjust to challenges like extreme temperatures, erratic rainfall, floods, drought, tropical cyclones, rising sea levels, tidal surges, salinity intrusion and ocean acidification. Creating a productive role for businesses and non-governmental actors, however, depends on a dedicated policy agenda.

***“Bangladesh is a highly climate vulnerable country whose emissions are less than 0.35 percent of global emissions.”***

## ***Climate Policy***

Bangladesh's INDC document begins with the fact that “Bangladesh is a highly climate vulnerable country whose emissions are less than 0.35 percent of global emissions.” Naturally then, Bangladesh is a strong advocate for dramatic emissions reductions by other nations. It goes on to warn that “if the world fails to take ambitious action, the costs to Bangladesh of climate change could amount to an annual loss of two percent of GDP by 2050 and 9.4 percent of GDP by 2100.” Against this backdrop, it is easy to see why most of Bangladesh's efforts will be focused on making the country more resilient to the effects of climate change. Despite its negligible contribution to emissions, Bangladesh also plans to reduce emissions by 15 percent from Business as Usual (BAU) levels, contingent on international support in the form of finances and technology.

## ***Mitigation***

In its INDC, Bangladesh notes that it plans to reduce carbon emissions by 5 percent without the support of the international community and by 15 percent with support by 2030. The reductions in emissions will primarily be in its power, transport and industrial sectors. This

goal provides an opportunity for Bangladesh to leverage mitigation to diversify livelihoods and create more quality jobs.

In the power sector, Bangladesh intends to diversify the existing electricity generation mix. Renewables offer a great opportunity to create direct and indirect employment opportunities. Bangladesh should formulate policies to introduce and expand renewable energy systems, from local to industrial scales. For example, it could guarantee payments to renewable energy producers for all the energy they feed into the grid. In the meantime, ensuring that renewable energy comprehensively reaches and serves marginalized populations will drive economic growth.<sup>23</sup> Renewable energy and its role in employment creation is discussed in detail in the section on India, which is witnessing massive investments in this sector.

In the transport sector, Bangladesh wants to induce a shift from road to rail, through a range of measures, including underground metro systems and bus rapid transit systems in urban areas. The benefits will include reduced congestion,

better air quality and improved traffic safety. Less congestion and ease of mobility will improve productivity levels of the economy. What's more, the investments in infrastructure that will be required, including building of expressways and public transportation systems, can create construction jobs in the short term and many other kinds of jobs in the long term for people at varying skill levels.

#### **Adaptation**

Roughly a quarter of Bangladesh floods in a normal year. Over the last 25 years, there have been six severe floods, which have inundated up to two-thirds of the country. Climate change is expected to increase the frequency and severity of floods even more in coming years.<sup>24</sup> Severe floods cause mass displacement and distress migration. In 2007, severe floods affected 32,000 square kilometers, displacing 16 million people and 3 million households. 85,000 homes were significantly damaged and 1.12 million hectares of cropland destroyed.

Building its emergency response capacity not only helps protect people's livelihoods but also

***Over the last 25 years, there have been six severe floods, which have inundated up to two-thirds of the country. Climate change is expected to increase the frequency and severity of floods even more in coming years.***

holds the potential to create new jobs in disaster management. Investments in improving skills and employment outcomes for people that do this work may incentivize people from flood-prone areas to return to their community and earn a living in the aftermath of a disaster. The National Plan for Disaster Management (2010-15) currently lists the building of a competent disaster management workforce as a strategic goal. Going forward, the training programs should target areas that are likely to be worst affected.

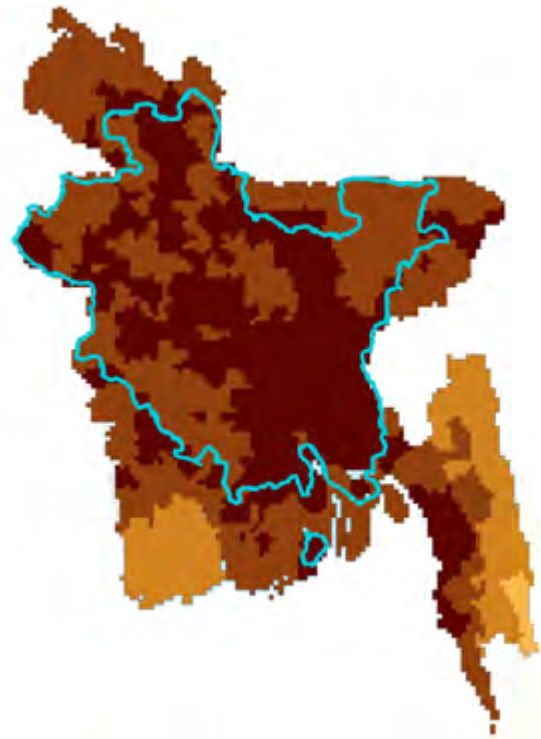
Floods not only destroy cropland; they also contaminate the fresh water supply and wreak havoc on sanitation services. Consequently, drinking water supplies grow limited, and a lack of clean water leads to the proliferation of contagious diseases. The World Health Organization (WHO) estimates that halving the proportion of people without sustainable access to healthy water globally could enhance the ability of people to work, creating economic value of over US\$ 200 million.<sup>25</sup> Thus, to sustain and grow labor productivity, it is important for Bangladesh to ensure capacity building in the areas of water treatment and purification.

***Floods contaminate the fresh water supply and wreak havoc on sanitation services. Consequently, drinking water supplies grow limited, and a lack of clean water leads to the proliferation of contagious diseases.***

Although the National Disaster Management Plan targeted 2011 as the year by which Bangladesh would be able to provide safe drinking water for all, recent fieldwork conducted by JustJobs Network shows that many districts in coastal Bangladesh, especially in the Khulna, Barisal and Chittagong divisions, lack access to potable water. The international community has an important role to play in providing technology and financing for water projects, but they should

leverage their efforts toward creating local capacity and generating local employment – which will also ensure the sustainability of their projects. Globally, time savings associated with better access to improved sources of water were valued at over US\$ 12 billion by the WHO. The gains from these interventions are also likely to benefit women in particular, as they are the ones who are usually responsible for tasks like fetching water.

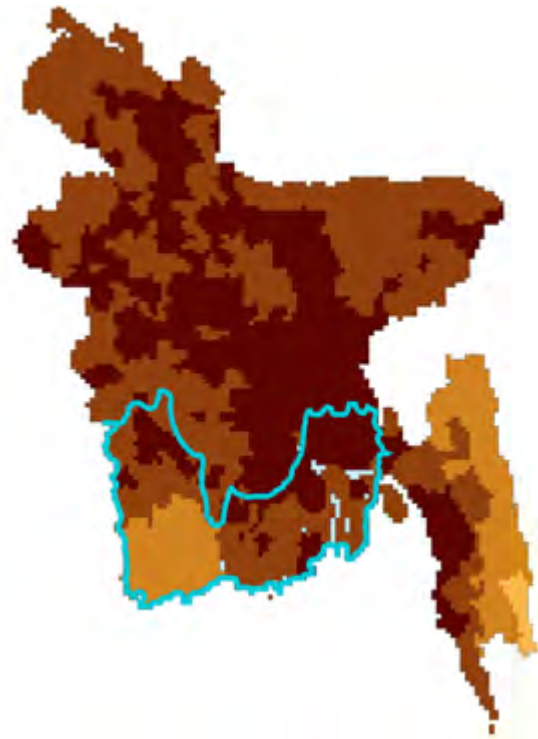
Cyclones and salinity intrusion bring forward another set of adaptation challenges for Bangladesh. According to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, climate change is likely



## Floods

**2/3** of Bangladesh can be inundated in the event of a severe flood.<sup>i</sup>

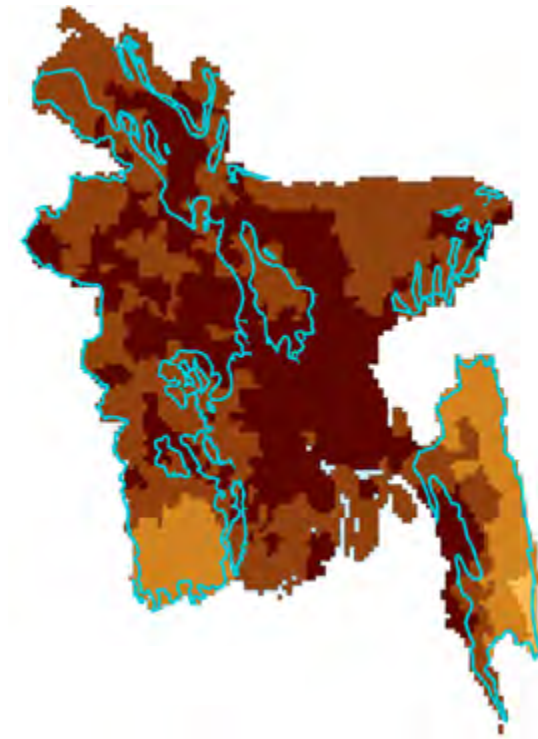
- Floods are caused primarily by heavy rainfall, snow melt, and cyclones.
- About one-quarter of the country floods in a normal year.<sup>ii</sup>
- In 2007, severe floods displaced 16 million people and destroyed 1.12 million hectares of farmland.<sup>iii</sup>



## Sea Level Rise & Salinity Intrusion

**01** million hectares of land – nearly the size of metropolitan Tokyo – is vulnerable to salinity intrusion.<sup>iv</sup>

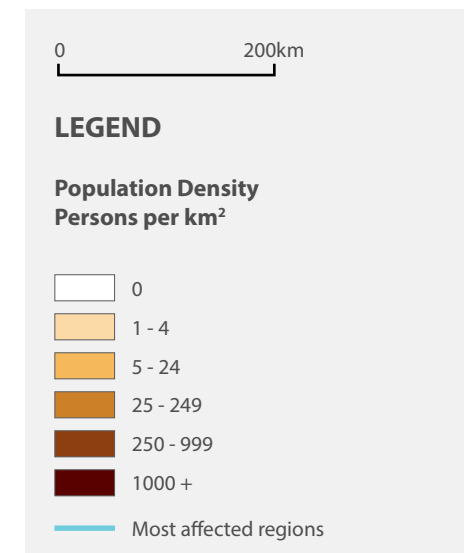
- Salt intrusion into agricultural lands is a result of storm surges that bring seawater into farms. Dry conditions raise salt levels further.
- Farmers cannot grow traditional crops on land where salinity intrusion has occurred.
- By infiltrating groundwater aquifers, salinity can also destroy sources of freshwater.



## Droughts

**53%** of Bangladeshis, or 83 million people, live in areas susceptible to drought.<sup>v</sup>

- Bangladesh has experienced many droughts over the last 50 years, but climate change will increase their intensity and frequency.
- Droughts routinely decrease yields of critical crops and staple foods, like wheat, sugarcane and potatoes.
- 47% of land area in Bangladesh is vulnerable to drought.<sup>vi</sup>



<sup>i</sup> Matthew Walsham. 2010. *Assessing the evidence: Environment, climate change and migration in Bangladesh*.  
<sup>ii</sup> Matthew Walsham, *ibid*.  
<sup>iii</sup> Mahmuda Khatun. 2013. *Climate Change and Migration in Bangladesh: Golden Bengal to Land of Disasters*.  
<sup>iv</sup> Timothy Russell. 2015. Interview with Jit Shankar Banerjee, July 25, 2015. (Dhaka: ILRI)

<sup>v</sup> IOP, *ibid*.  
<sup>vi</sup> IOP. 2009. *Adaptive measures for coping with increased floods and droughts in Bangladesh*.

to produce an increase in wind speeds and precipitation during cyclones as well as an increase in the frequency of the most intense storms.<sup>26</sup> In particular, the major urban centers of Chittagong and Khulna are drastically impacted. Salinity damages crops, hampers irrigation efforts for crops in freshwater areas, and decreases agricultural productivity. Fields intruded by saltwater are rendered useless.<sup>27</sup> By infiltrating groundwater aquifers, salinity destroys the amount of readily available freshwater. Currently, some wells in coastal areas are required to reach 250 meters deep to obtain fresh water. And as sea levels rise with the changing climate, salinity will creep further inland.<sup>28</sup>

Filtration and desalination plants are expensive, and Bangladesh will be dependent on climate finance through the Green Climate Fund (GCF) and other Development Finance Initiatives (DFIs) for the establishment of these projects. These financing mechanisms could provide loan guarantees to enable easier access to finance for small and medium enterprises trying to innovate in this field. Institutions should create linkages with local companies in order to transfer knowledge and skills so that these projects become stronger

investment channels and create sustainable local employment.

A report examining the distribution of private sector projects among six DFIs found that, despite their greater needs, low-income countries received less than 10 percent of money flows from the DFIs' portfolios.<sup>29</sup> Small and medium enterprises, given their key role in creating employment, should be given special attention as the international community considers more equitable ways of distributing finance for business models aimed at climate change mitigation.

In the areas worst hit by salinity, farmers have constructed fencing (*gher*) around their land and actually collect saline water in which they

raise sea fish like shrimp.<sup>30</sup>

Although a commercially viable livelihood, shrimp cultivation requires high capital investments, and costs of production can be prohibitive. Some farmers have taken loans to enter the business, and then gone bankrupt when their

shrimp get infected by viruses that thrive in high temperatures.<sup>31</sup> The high cost of shrimping is also causing dispossession. In many villages, larger players such as non-resident Bangladeshis have acquired tracts of land from loss-making

***Currently, some wells in coastal areas are required to reach 250 meters deep to obtain fresh water. And as sea levels rise with the changing climate, salinity will creep further inland.***

farmers who now work as employees on these shrimp farms.<sup>32</sup> A report by the Solidarity Center highlights poor labor standards in the shrimp processing industry. According to the report, the sector is notorious for paying below the minimum wage, gender discrimination in pay, and child labor.<sup>33</sup>

Another negative side-effect of the proliferation of shrimp farms on agricultural land is salinity ingress in surrounding rice fields. Members of these communities are yet to reach a consensus on water management, and conflicts often take place when saline water from shrimp farms enters rice fields in the absence of proper drainage mechanisms.

With access to better preservation and packaging facilities locally, many families of the coastal divisions could jump on to the shrimp bandwagon. A stronger certification regime that addresses the violations of workers' rights can also ensure that these communities find greater prosperity in the harsh circumstances imposed upon them by climate change.

The deleterious effects of climate change – manifest in its floods, cyclones, droughts and

increasing salinity – will disproportionately affect Bangladesh's poor, especially the millions that reside in its low-lying Delta region.<sup>34</sup> The government and residents themselves are increasingly turning to internal and international labor migration of unskilled workers as a coping mechanism for environmental and associated economic challenges.<sup>35</sup> Approximately 40 percent of Bangladeshi migrant workers come from five of 64 districts: Brahmanbaria, Chittagong, Comilla, Dhaka, and Tangail – in the south of the country.<sup>36</sup> These areas are especially prone to flooding and other environmental disasters.

***The deleterious effects of climate change – manifest in its floods, cyclones, droughts and increasing salinity – will disproportionately affect Bangladesh's poor, especially the millions that reside in its low-lying Delta region.***

Protracted droughts and salinity intrusion will result in job losses that, first, contribute to permanent rural-to-urban migration. To begin, migrants will move to the nearest cities, and then they will move to major cities such as Dhaka and Chittagong. Second, the pace of international

migration will likely pick up. Emigrants will follow well established labor migration routes to the United Arab Emirates and Qatar, with most international migrants to the Middle East being male and either unskilled or semi-skilled.<sup>37</sup> The number of undocumented migrants may also climb, along established irregular migration

routes from Bangladesh to the Indian states of West Bengal and Assam.

***Conclusion***

In the immediate aftermath of a natural disaster such as a cyclone, relief efforts and the need to rebuild will generate jobs. And in the face of protracted crises, people will be forced to adapt. But these transitions occur faster than the

ability of institutions – government, business or unions – to keep up. The ultimate result is more precarious work and more vulnerable workers. Therefore, it is pertinent for decision makers to ensure a two-pronged approach is taken toward improving disaster management in the short run and helping generate livelihoods more resilient to climate change in the long run.

# India

India is projected to be the most populous nation by 2022<sup>38</sup> and with close to half of its population still engaged in agricultural activities, its workforce will be especially vulnerable to the effects of climate change. Climate projections through 2030 suggest that the likely impact of changing temperatures will be concentrated in four major regions in India: the Himalayan region, the Western Ghats, northeast India and the coastal zone.<sup>39</sup> These regions are not only home to hundreds of millions of people; they also host several important economic sectors, such as agriculture, manufacturing, trade and financial activities on the western and southeastern coastlines, and tea and coffee cultivation in the hills of the Western Ghats and the northeastern state of Assam.

## ***Climate Policy***

India's approach to adaptation and mitigation must be seen in the context of the current government's commitment to rapid industrial growth bolstered by higher energy production through conventional sources along with investments in renewable energy.

***Climate projections through 2030 suggest that the likely impact of changing temperatures will be concentrated in four major regions in India: the Himalayan region, the Western Ghats, northeast India and the coastal zone.***

India is targeting a 33 to 35 percent decrease in emissions intensity per unit of GDP by 2030 as compared to 2005. The other notable target included in its INDC is increasing the share of non-fossil fuel power generation from 30 percent of total capacity to 40 percent by 2030. Commitments to renewable energy development have the potential to create many new jobs in India, which is already the world's sixth largest employer in the renewable energy sector.<sup>40</sup> On the adaptation front, agriculture, water, health and disaster management already have policies that address the effects of climate change. The Himalayan region, coastal region and small islands have also been identified as being more vulnerable.

## ***Mitigation***

India's mitigation goals have been the subject of intense discussion since they were released in the beginning of October 2015. It is reasonable to assume that a majority of India's mitigation efforts will come through the development of clean energy. The government has also committed to



a target of 175 GW of renewable energy capacity by 2022, independently of the targets in the INDC. The 175 GW target includes expanding capacity to 100 GW of solar energy and 60 GW of wind energy from the current installed capacity of just 4 GW and 24 GW, respectively.<sup>41</sup>

Some commentators argue that while the target for renewable energy outlined in the INDC – i.e. increasing non-fossil fuel generation capacity to 40 percent by 2030 – is ambitious but achievable, the 175 GW target for renewable energy is not only aspirational but unrealistic.<sup>42</sup> This is because renewable energy technology, especially solar energy, will only achieve cost parity with fossil fuels by 2018<sup>43</sup> and India's grid infrastructure will also need to be updated to source a larger proportion of energy from renewable sources, as their supply is more variable.<sup>44</sup> Nonetheless, the ambitious target has created interest around the renewable energy sector in India and the buzz has even translated into investments. From a labor market perspective, what is especially encouraging is the fact that a significant amount of investment will be channeled towards domestic renewables-related manufacturing.<sup>45</sup>

***The process of expanding renewable energy capacity from the conceptual to the generation stage would directly create jobs in manufacturing, construction, operation and maintenance.***

The JustJobs Network, in its report “Harnessing India's Productive Potential Through Renewables and Jobs,” notes that renewables can generate more and better employment, provided their production is not constrained by financing, infrastructure, and the availability of a skilled workforce, among other considerations. The report highlights four ways in which scaling up renewable energy production would create jobs across regions and at varying skill levels. The process of expanding renewable energy capacity from the conceptual to the generation stage would directly create jobs in manufacturing, construction, operation and maintenance. Large-scale manufacturing would boost employment through backward linkages with other industries like plastics, steel and electronics as well as through the development of ancillary industries. Off-grid and small-scale generation would create employment and spur skill development in remote rural areas. Lastly, greater energy security and universal electrification would boost productivity and economic activity across the board.<sup>46</sup>

One of the report's recommendations

emphasizes the need for low-cost financing for the renewables sector, especially for small and medium enterprises, and suggested issuing bonds. Recently, the government has approved the sale of tax-free infrastructure bonds worth over US\$ 700 million, exclusively for investments in renewable energy.<sup>47</sup>

The government has also adopted an innovative method to bring in foreign capital, where solar purchase agreements will be underwritten in dollar terms, thus eliminating hedging costs for investors and paving the way for low-cost foreign financing to be made available.<sup>48</sup> The Indian government is committed to its targets and to tackling other constraints such as land acquisition and skill development to boost the development of renewable energy.

While the bulk of expansion in capacity will come through mega and ultra-mega energy projects, the impact of small-scale and off-grid renewable energy projects on livelihoods will be much greater, especially since one-third of Indian households lack access to electricity. The NITI

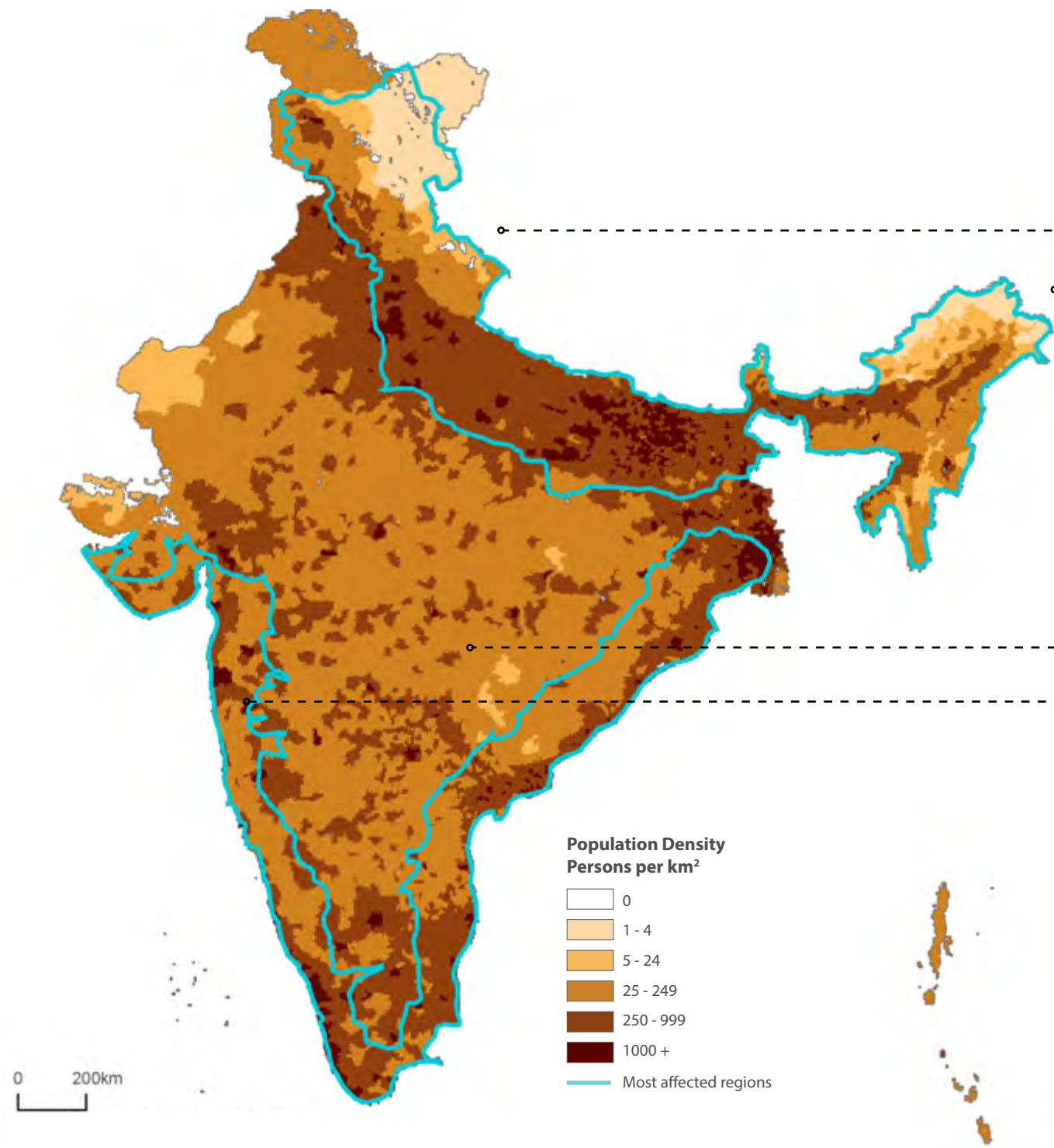
Aayog – the central government’s policy planning body – in its report on renewable energy identified the need for state utilities to take responsibility for implementing off-grid projects. The report also suggested the formulation of district- and block-level plans for electrification.<sup>49</sup> The current system however is heavily dependent on the central government and has largely been limited to pilot projects. By adopting a localized approach to off-grid electrification, the government could speed up implementation by inviting local governing

bodies, like Gram Sabhas, to express their willingness to manage off-grid systems. Viability of these projects could also be addressed by allowing renewable energy producers to set tariffs at the village level.

Another notable policy that has been mentioned in

the context of mitigation in the INDC is the development of a green transportation network. This will entail construction of transportation infrastructure in the form of dedicated freight corridors for the railways, ports and inland waterways. Not only will the development of rail and water-based transportation reduce logistical and environmental costs, it will also lead to the

***While the bulk of expansion in capacity will come through mega and ultra-mega energy projects, the impact of small-scale and off-grid renewable energy projects on livelihoods will be much greater, especially since one-third of Indian households lack access to electricity.***



### Himalayan Region

**500** million people depend on glacial melt water from the Himalayas.<sup>i</sup>

- Precipitation will increase 5-13% by the 2030s as compared to the 1970s, leading to flooding and landslides and threatening agriculture.
- Increased frequency of forest fires will endanger a major source of fuel: wood.
- Glacier melt causes soil erosion and flash flooding, hurting farmers.

### Northeast

**01** million people depend on the tea industry in northeast India for their livelihood.<sup>ii</sup>

- Tea plantations will experience negative consequence due to soil erosion, rising temperatures and unpredictable rainfall.
- Due to changing weather conditions, rice production will fall while cereal production has the potential to increase.
- Landslides and runoffs will increase in frequency during summer rains.

### Western Ghats

**50** million people are supported by the Western Ghats ecosystem.<sup>iii</sup>

- Unpredictable rain will threaten the livelihoods of those who depend on the region's critical tea and coffee industries.
- Increased amount and intensity of rainfall will produce soil erosion and flooding.
- Flash floods are likely to cause temporary distress migration.

### Coastal Zone

**50cm** sea level rise will occur in India by 2100.<sup>iv</sup>

- An increase in intensity of cyclones will bring storm surges and salinity intrusion in critical farmland.
- Rainfall intensity will increase, while rainfall frequency will decrease, causing extra stress on the agriculture sector.
- Sea level rise will submerge crucial habitats and ecosystems, such as mangroves.

<sup>i</sup> Nicholas Berini. 2010. *Himalayan glaciers: how the IPCC erred and what the science says.*

<sup>ii</sup> Sushanta Talukdar. 2011. "Reverse migration a worrying trend for Assam tea industry". *The Hindu*, August 7, 2011.

<sup>iii</sup> Press Trust of India. 2014. "Population density may have hit Western Ghats ecosystem: Government." *Economic Times*, July 27, 2014.

<sup>iv</sup> Effect of Global Warming and Climate Change on Coastal Zones and Sea Level. 2011. Prof. (Dr.) K.C.Jena Moon Rani Mishra. *Orissa Review*

creation of new jobs. The Economic Survey 2015 has picked the railways as the preferred channel for public investments in infrastructure. The high degree of forward and backward linkages with the railways is an indicator of high returns on investment in this sector.<sup>45</sup>

### **Adaptation**

India has a diverse geography and will therefore face different problems in different regions. The adaptation framework will accordingly have to address these problems through a regional lens.

Along the coastal areas, unprecedented flooding and soil erosion caused by increased rainfall will result in a loss of lives and temporary distress migration. Rising sea levels will increase the incidence of floods, exacerbate soil erosion, and raise water tables. Resulting migration could take the form of 'managed retreat' or 'progressive abandonment' of land and structures in extremely susceptible areas. The inhabitants of these areas will ultimately be forced to seek permanent resettlement as a reaction to rising sea levels and erosion.<sup>51</sup>

The primary impact on livelihoods in this region will be in agriculture. Some areas like southwest Karnataka, parts of Tamil Nadu, and parts of

Maharashtra may see coconut yields decrease up to 24 percent. The majority of the region is projected to witness rice yields decline by about four percent. Climate change is likely to reduce yields of maize and sorghum by up to 50 percent, depending on the region.<sup>52</sup>

Sea level rise will also negatively impact the tourism industry, upon which millions of people in the states of Kerala and Goa depend for their livelihoods. Dwindling fishing yields will also result from changing currents and water temperatures. Taken together, these negative impacts on employment will make circular migration more frequent and exacerbate permanent out-migration.

***Climate change is likely to reduce yields of maize and sorghum by up to 50 percent, depending on the region.***

Currently, Delhi, Gujarat and Maharashtra are top destinations for circular migrants.<sup>53</sup> Migrants leave their homes for short-term access to food, water

and shelter, and seek out temporary income-generating activities. Such temporary forms of employment tend to be precarious. Migrant workers enjoy little to no legal protections when they migrate, making them particularly susceptible to exploitation.

Many climate migrants end up working in the construction industry, which employs about 45

million people across India.<sup>54</sup> Construction is one of the most hazardous and precarious sectors, particularly for women. About 97 percent of women working in construction in India are informal workers, hired on short-term verbal contracts or as day laborers.<sup>55</sup>

The adverse effects are apparent across India since agriculture in every region is vulnerable to climate change. Central India may suffer from droughts of increasing intensity and frequency as it is already susceptible to water shortages in the event of variations in rainfall. Agriculture in Punjab and along the Gangetic plains depends on rivers whose glacier sources in the Himalayas are shrinking at a rapid pace.

It is essential for India to invest in the development of seeds that are resilient to these impacts and allow farmers to smooth productivity and income through downturns.

Additionally, there should be a focus on extending training facilities to these areas so that agricultural workers can transition to other sectors. Sustainable watershed management practices also need to be adopted, with grassroots organizations taking the lead on disseminating this information to communities.

As the case of the tea industry in Assam (see box) clearly demonstrates, industries that rely on agricultural inputs will be impacted severely by climate change. Producers of agricultural products

### **Box 2. Spotlight: Tea Plantations in Assam**

In the hills of Assam, changes in rainfall patterns and high temperatures are threatening the sustainability of tea plantations, which provide livelihoods to around one million workers.<sup>56</sup> While evenly distributed rain previously made year-round tea processing possible, today rainfall is erratic, making harvesting less predictable. Only large plantations, as opposed to smallholder farms, are able to cope. If the result is worker layoffs, it will reduce the bargaining power of tea plantation laborers, who have been striving to organize themselves and recently succeeded in arguing for a higher minimum wage.<sup>57</sup>

Erratic rainfall has also caused problems in the manufacturing units. With heavy crop yields in one season followed by lean crop yields in another, manufacturing units owned by large producers often refuse to purchase from Small Tea Growers (STGs) when they are overloaded with their own produce. STGs can't afford their own units and are entirely dependent on bigger producers or independent factories. So the harvest has nowhere to go for processing.

Many STGs are attempting to diversify their livelihoods by tapping into organic and green tea and moving away from traditional black tea. Some growers are investing in tea tourism by building accommodation facilities around their scenic gardens.

are also entirely dependent on processing plants to sell their harvest. To streamline the supply of agricultural products, the government will have to facilitate the creation of an extensive network of logistical support. From transport infrastructure to cold storage and warehousing, the supply chain will have to be insulated from variance in the climate. The logistics sector has the potential to create jobs of varying skill levels across the country, while simultaneously increasing productivity and competitiveness. However, the challenge of protecting the livelihoods of farmers and transitioning workers from agriculture to other sectors remains formidable.

### **Conclusion**

Shoring up the rural economy to deal with the challenges of climate change must be one of India's development priorities. Part of this effort involves creating jobs for agricultural workers in other sectors. More than 45 percent of India's

workforce continues to labor in agriculture, even though its share in national income is only 18 percent.<sup>58</sup> Given India's population, this is a difficult task that will only be made more difficult by the effects of climate change.

Adapting to climate change will also require investment in previously underdeveloped sectors like supply chain management. India's policies

***Shoring up the rural economy to deal with the challenges of climate change must be one of India's development priorities.***

for mitigation in the INDC have the potential to lead to win-win outcomes for the environment and the economy, especially in the renewable energy and transportation sectors. They will however, require bold action on the part of the government. The challenge will be in channeling

investment into these sectors and supplementing it with a workforce that possesses the right skill set.

# Indonesia

Indonesia is the world's fourth most populous nation. The country is made up of 17,508 islands and contains over 80,000 kilometers of coastline,<sup>59</sup> making it especially vulnerable to the harmful effects of climate change.

Like many other developing countries, Indonesia's economy relies heavily on its natural resources. Strong and stable economic growth, averaging five percent annually since the turn of the century, has lifted millions out of poverty. The share of the population living on US\$ 2 or less per day in purchasing power parity terms declined from 67 percent in 2002 to 43 percent in 2011.<sup>60</sup>

Yet in addition to those that are still poor, 40 percent of Indonesia's population remains vulnerable to crises or shocks, such as sea level rise and flooding caused by climate change.<sup>61</sup>

Many are just an emergency away from falling back into poverty, making the adverse effects of climate change particularly important to understand in an Indonesian context.

## **Climate Policy**

The Indonesian government recognizes and addresses these vulnerabilities as part of its

Intended Nationally Determined Contributions (INDCs). Indonesia has a voluntary target of reducing emissions by 26 percent by 2020. It intends to reduce emissions further, by 29 percent, by 2030. Due to its vulnerability to natural disasters and rising sea levels, it has also outlined a climate resilience strategy. The mitigation and adaptation policies it has chosen will have both short-term and long-term effects on livelihoods across Indonesia.

## **Mitigation**

According to the INDC, "most emissions (63 percent) are the result of land use change and peat and forest fires," and the primary mitigation measure has been a moratorium on deforestation and on the conversion of peat lands that was first initiated in 2010. However, the enforcement of the moratorium is notoriously lax and every year, forest fires are started in the dry season to clear land.

Not only do these forest fires contribute to emissions, they pose a serious health hazard that affects productivity of workers in Indonesia and beyond. For instance, the forest fires this

***In addition to those that are still poor, 40 percent of Indonesia's population remains vulnerable to crises or shocks, such as sea level rise and flooding caused by climate change.***



### Box 3. Spotlight: Forest Fires in Kalimantan and Sumatra

Since July, forest and peatland fires in Kalimantan and Sumatra enveloped the Indonesian archipelago as well as neighboring countries like Singapore, Malaysia and Thailand in a blanket of haze. The fires were particularly difficult to control due to the effect of the El Niño, which extended the dry season in Indonesia.<sup>63</sup> According to Global Fire Emissions Database (GFED), “fire CO<sub>2</sub> emissions are [usually] compensated for by re-growing vegetation after a fire and should not be compared to fossil fuel emissions, but that is not the case when forests are burned to make way for other land uses or when peat is burned. That is exactly what happens with the vast majority of the fires in Indonesia and these fires are thus a net source of CO<sub>2</sub> as well as other greenhouse gases.” According to the most recent estimates, emissions from Indonesia crossed 1.75 billion metric tons of CO<sub>2</sub>, exceeding Japan’s total emissions in 2013.<sup>64</sup>

year may be one of the worst environmental disasters in the last decade (see box). Besides the environmental damage, the smoke plumes from the fires blanketed Southeast Asia in haze and air quality declined drastically. In Indonesia alone, more than half a million people reportedly suffered from respiratory ailments since July.<sup>62</sup> While it is difficult to estimate the exact effect the fires have had on the Indonesian economy, it is safe to assume that the excessive pollution levels will cause a decline in both agricultural yields as well as labor productivity.

The fact that the forest fires have been particularly bad this year may lead to changes in land use planning and stricter enforcement of the moratorium. Since the moratorium, availability of arable land has declined.<sup>65</sup> Thirty-five percent of Indonesia’s population depends on agriculture and forestry for employment. The expansion of

palm oil cultivation, which is Indonesia’s most valuable export after oil and gas,<sup>66</sup> may also be limited by this moratorium.

Forestry and plantations provide employment to a large number of people, but they have been criticized for exploitative working conditions and unsustainable practices. The World Resources Institute argues that the moratorium will “help limit unsustainable expansion, and instead spur companies to use existing farmland more efficiently and productively.” This argument is based on the potential to increase yields and utilize degraded lands for plantations. They also suggest that the moratorium on deforestation will push palm oil producers in Indonesia to acquire certification in order to secure access to markets like the US and EU,<sup>67</sup> which would aid workers. The conditions for certification by organizations such as the Roundtable on Sustainable Palm Oil (RSPO)



and Indonesian Sustainable Palm Oil (ISPO) ensure not only that palm oil production does not cause deforestation, but also that workers are treated in accordance with international labor standards. Mitigation efforts that target forestry and palm oil plantations will push producers and buyers towards a more sustainable and fair model of production. However, if land availability is reduced significantly in the short run, growth in employment opportunities will also be restrained.

For a smooth transition to sustainability, intervention by the government would need to go beyond enforcing the moratorium. The moratorium will be harder to enforce if no alternative land is provided for cultivation or alternative livelihood for plantation workers. First of all, the government should award concessions for forestry and palm oil cultivation in areas with degraded lands. The government would also have to play an active role in providing the required technologies for increased productivity as well as institutional support for certification, especially to small farmers who comprise one-third of all palm oil producers. Suppliers and consumers of forestry and plantation products must be vigilant and assertive with regard to the conditions of work and sustainability practices at the source,

***Sixty percent of Indonesia's population and 80 percent of its industry is located in vulnerable coastal areas.***

in order to encourage more producers to obtain certification.

The mitigation effort faces a difficult challenge in balancing the need to protect the forest cover and the need for cultivable land. The challenge will only grow in complexity as climate change causes sea levels to rise and pushes more people inland from vulnerable areas on the coasts.

#### ***Adaptation***

Sixty percent of Indonesia's population and 80 percent of its industry is located in vulnerable coastal areas.<sup>68</sup> The potential consequences of flooding and sea level rise for Indonesia's economy and labor market are enormous. Adaptation measures will play an important role in ensuring the sustainability of livelihoods in these areas.

Intense rainfall and rising sea levels as a result of climate change will have a significant effect on livelihoods in the nation. The intensity of rainfall is projected to increase by as much as 2 to 3 percent per year and the rainy season is expected to grow shorter. This means a substantial increase in the risk of floods.<sup>69</sup> A study published in 2007 by Indonesia's Institute for Technology in Bandung modeled sea level rises of 0.25, 0.57 and 1 cm per year, finding that by 2050

these rises would drown 40, 45 and 90 square kilometers of land in north Jakarta alone.<sup>70</sup>

The marine fishing industry is already witnessing the effects of climate change, making attempts to adapt. During fieldwork in Central Java, JustJobs Network conducted interviews with marine fishermen. A decline in output and increasing intensity and frequency of storms had made fishing a less sustainable livelihood than in the past. The fishermen expressed a desire to make a living on land as opposed to fishing. This evidence is corroborated

by national trends in production and employment. According to the United Nation's Food and Agricultural Organization, while capture fishing still yields about two-thirds of total production, output has stagnated and employment in the sector has declined. Aquaculture or fish

farming on the other hand has witnessed rapid growth in employment and output over the last decade.<sup>71</sup> Data therefore indicates that the fisheries sector is adapting to declining yields in capture fishing by switching to aquaculture.

In order to build resilience to climate change

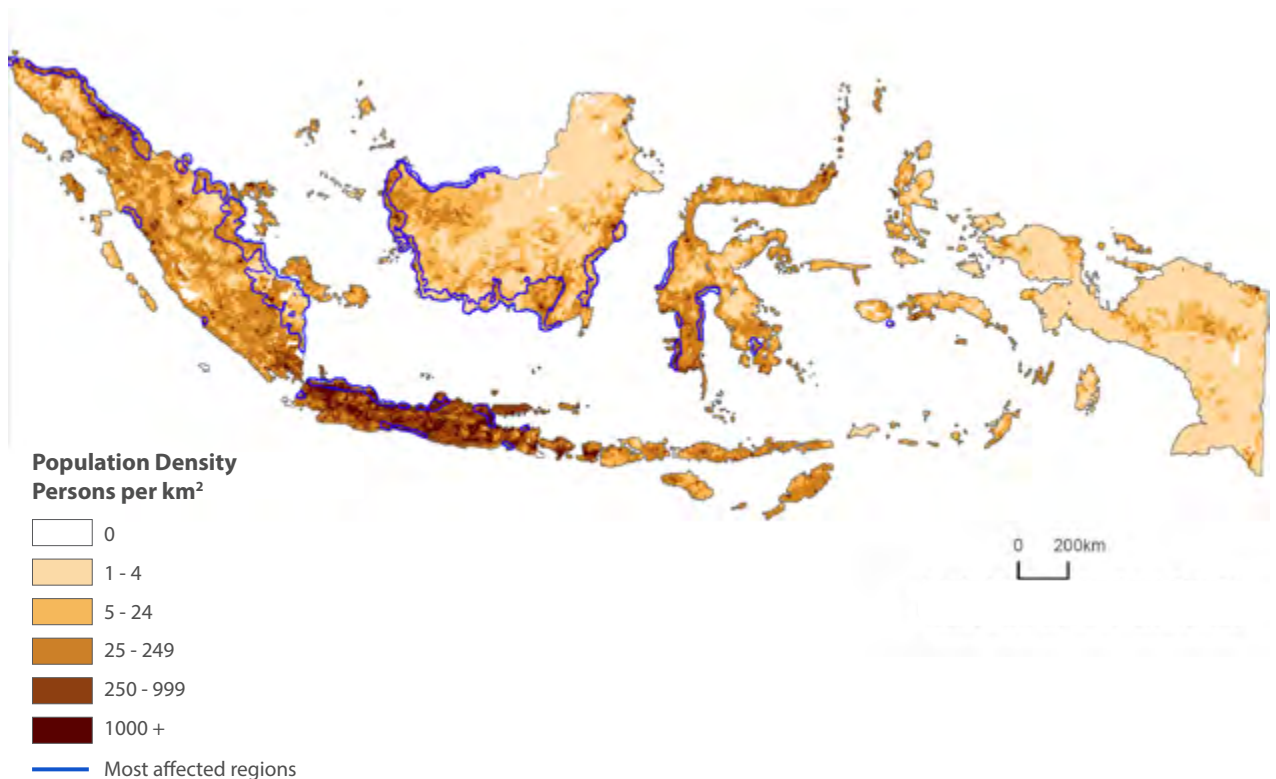
in these areas and especially this sector, the FAO suggests an ecosystem-based approach. By improving the resilience of ecosystems as a whole, the resilience of all livelihoods dependent on that ecosystem can be improved.<sup>72</sup> An example of this approach is the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF), in which Indonesia is involved. The multilateral initiative by six countries seeks to protect the coral reef ecosystem in the Coral Triangle region. The initiative proposes to establish a Marine Protected Area. It also proposes to address

the vulnerabilities of the coastal areas by increasing green cover and developing alternate livelihoods like aquaculture in a sustainable manner where required.

Much of Indonesia's fertile agricultural lands are also located in low-lying coastal areas.

Shorter rainy seasons and flooding will disrupt agriculture, adversely affecting the 35 percent<sup>73</sup> of Indonesians who rely on the sector to earn a living. Both flooding and salinity intrusion due to sea level rise will drastically decrease yields, exerting downward pressure on wages in a sector that already has the

***According to the FAO, while capture fishing still yields about two-thirds of total production, output has stagnated and employment in the sector has declined. Aquaculture or fish farming on the other hand has witnessed rapid growth in employment and output over the last decade.***



## Sea Level Rise

**60%** of Indonesia's population and 80% of its industry is located in vulnerable coastal areas.<sup>i</sup>

- Over 80,000 Indonesian farmers will be forced to seek other income sources due to farm flooding from sea level rise.<sup>ii</sup>
- Beyond flooding, sea level rise also causes salinity intrusion into agricultural land.
- Indonesia faces a paradox: Climate change will speed up migration to urban areas, but most of its cities are vulnerable to coastal flooding.

## Rainfall

**440,000** people were displaced by the Jakarta floods of 2007 which caused US\$ 450M in damage.<sup>iii</sup>

- The intensity of rainfall is expected increase about 2% to 3% per year.
- The Maluku region in eastern Indonesia will see the largest increase in rainfall.
- Despite the increase in rainfall, many parts of the country will experience a shorter rainy season, threatening agricultural cycles.

<sup>i</sup> Triarko Nurlambang. 2011. Public policy matters on climate change and migration in Indonesia. *Climate change, migration and human security in southeast asia*: 74.

<sup>ii</sup> Mariah Measey. 2010. *Indonesia: a vulnerable country in the face of climate change*. *Global Majority E-Journal* 1.1, 31-45.

<sup>iii</sup> Michael Case, Fitriani Ardiansyah and Emily Spector. 2007. *Climate change in Indonesia: implications for humans and nature*.

lowest wages in the country. Estimates suggest that more than 43,000 farm laborers will lose their jobs in the Subang region of West Java alone.<sup>74</sup> Overall, more than 81,000 farmers will have to seek other sources of income due to the flooding of farms from rising sea levels.<sup>75</sup>

Floods provoked by climate change have the potential to drastically impact economic activity across Indonesia, including in urban centers. As an illustration, the Jakarta flood in February 2007 affected 80 districts, paralyzing transportation and services in the affected areas. In the flood, an estimated 420,000 to 440,000 people were displaced from their homes.<sup>76</sup> The Indonesian government estimated that losses reached IDR 4.1 trillion (US\$ 450 million).

The development of disaster preparedness and response mechanisms will have to be an area of focus for adaptation measures. The National Action Plan for Climate Change Adaptation outlines a strategy for livelihood resilience that revolves around bolstering health, infrastructure and settlements in preparation for climate-induced disasters.

As discussed in the context of Bangladesh, disaster preparedness and management has the potential to create employment and investment opportunities. This is particularly the case in Indonesia, which is proposing major infrastructure investments to develop settlements that are resilient to climate change. This includes opportunities in the development of adaptive energy infrastructure as well.

### **Conclusion**

Indonesia has to contend with being both extremely vulnerable to climate change and, in recent years, being one of the top contributors to emissions. It also has to walk a thin line as it protects its forests from encroachment and provides opportunities inland to those displaced by disasters along its coasts. In some ways, this challenge reflects the fine balance that the world must find between respecting the limits of our planet and at the same time expanding the opportunities for its people.

***More than 81,000 Indonesian farmers will have to seek other sources of income due to the flooding of farms from rising sea levels.***

# Conclusion

Climate change not only threatens to disrupt the impressive economic growth trajectories of Bangladesh, India and Indonesia, as well as other countries at similar stages of development. It also threatens to reverse the gains these countries have made so far.

Through both sudden disasters and protracted changes over time, climate change will have a devastating effect on jobs and incomes. Disruptions of employment instigate mostly temporary and circular migration that not only strips workers of their incomes, but in many cases their rights and community networks. This is especially true in the absence of strong and stable governance, worker protections, social safety nets and institutions that provide basic services.

Migration induced by climate change can lead to oversaturation of labor markets, especially in urban areas, exerting downward pressure on wages and working conditions. This speeds up the rise of precarious work arrangements and informality and generates opportunities for exploitation.

Climate change especially affects the poor, many of whom depend on natural resources for their livelihoods and lack the incomes necessary to save for the emergencies that climate change

creates. Among the poor, marginalized groups such as women are most likely to bear the brunt of the challenges posed by climate change.

But climate change will also create opportunities as governments, businesses and workers act to mitigate emissions and adapt to the changing environment. A lot of activities will become unsustainable – either because they cause environmental damage or are themselves affected by changes in the environment. Adapting to the loss of livelihoods, particularly in the agriculture sector, is of prime importance. But opportunities in areas like renewable energy, supply chain management, and disaster management will emerge – not, however, at the scale necessary to create enough opportunity for all those that will be affected.

The experience of these three nations highlights a reality that must feature prominently in debates on how to mitigate and especially adapt to climate change. Beyond temperature increases and the percentages of emission cuts, people are already witnessing the erosion of their livelihoods due to the adverse impacts of climate change. Governments, businesses and trade unions will have to play their part in ensuring that people have access to more and better jobs in order to make these transitions as painless as possible.

Policymakers must adopt legislation and implement policies to protect the rights of migrant workers. They must work with the private sector to enhance the capacity of workers to adjust to changes through active labor market

programs such as skills training and labor market matching. Moreover, they must invest in sectors such as renewable energy, which not only help the environment, but also generate employment.

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[venkatesh@whitespace35.com](mailto:venkatesh@whitespace35.com)  
+91 97414 51309